Tanta University	3rd year, Computers & Control Dept.
Faculty of Engineering	Digital Control

Sheet 5

1. For the following open-loop Transfer functions:

   i. $\overline{GH}(z) = \frac{0.0952kz}{(z-1)(z-0.965)}$

   ii. $\overline{GH}(z) = \frac{z+0.9}{z(z-0.5)}$

   iii. $\overline{GH}(z) = \frac{z+1}{(1-z)^2}$

   iv. $\overline{GH}(z) = \frac{z}{(z^2-1)(z^2-z+0.5)}$

   Calculate the steady-state error for input:

   a) A unit step
   b) A unit ramp
   c) $r(t) = 3u(t) + 2t$

2. For the following open-loop Transfer functions:

   i. $\overline{GH}(z) = \frac{0.0952kz}{(z-1)(z-0.905)}$

   ii. $\overline{GH}(z) = \frac{k(z+0.9)}{(z-1)(z-0.7)}$

   iii. $\overline{GH}(z) = \frac{kz(z-0.5)}{(z-1)(z-0.8)}$

   iv. $\overline{GH}(z) = \frac{k(z-0.2)}{(z-1)(z+0.6)^2}$

   v. $\overline{GH}(z) = \frac{0.15k(z+0.7453)}{z(z-1)(z-0.4119)}$

   a) Draw the root locus
   b) Calculate the range of K for stability

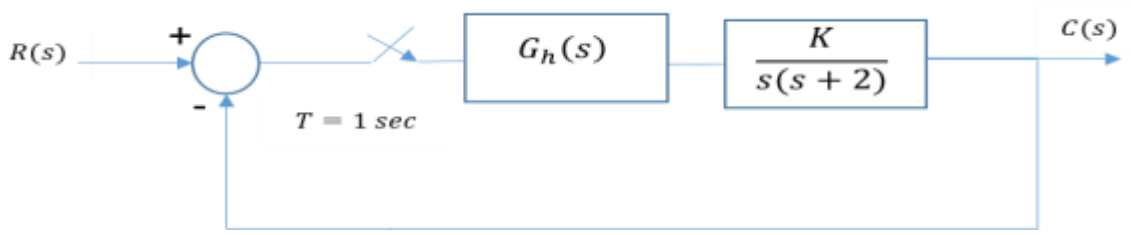
3. Consider the system given by:

$$\overline{GH}(z) = \frac{z+1}{(1-z)^2}$$

Assuming that the system is controlled by again controller (K) in a unity feedback:

a) Plot the root locus
b) Can you stabilize this system with a gain controller?

4. Find using the root locus technique the stability range for the system shown in figure below.



5. Assume a unity feedback system with the transfer function

$$G(z) = Tz^{-1}(1-z^{-1})$$

And a proportional control gain K show that instability results if $KT > 0.5$.